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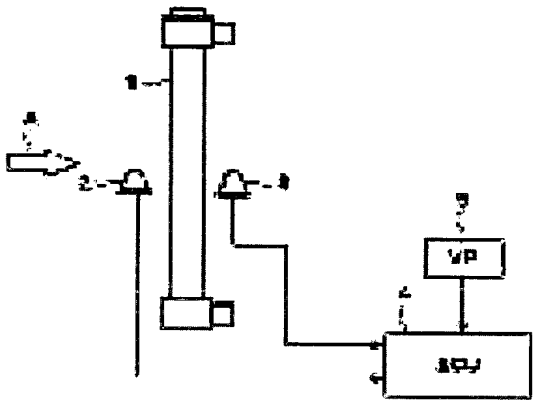
(54) OZONE PURIFYING DEVICE FOR VEHICLE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an ozone purifying device for a vehicle provided with a function capable of surely detecting deterioration of an ozone purifying catalyst caused by various kinds of factors such as deterioration due to sticking of foreign matter such as dust and deterioration due to SOx.
SOLUTION: Ozone concentration CTO3U in air before passing the ozone purifying catalyst carried on a radiator 1 and ozone concentration CTO3L in air after passing the ozone purifying catalyst are detected. Based on the ozone concentration CTO3U and CTO3L, a deterioration degree of the ozone purifying catalyst is detected.



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CLAIMS

[Claim(s)]
[Claim 1] The ozone purge for vehicles characterized by providing the following. The ozone purification catalyst carried in vehicles. The 1st ozone level detection means which detects the ozone level in air before passing the aforementioned ozone purification catalyst. The 2nd ozone level detection means which detects the ozone level in air after passing the aforementioned ozone purification catalyst. A degradation detection means to detect degradation of the aforementioned ozone purification catalyst using the output of the above 1st and the 2nd ozone level detection means.
[Claim 2] It is the ozone purge for vehicles according to claim 1 which is further equipped with an air-capacity detection means to detect the air capacity which passes the aforementioned ozone purification catalyst, and is carried out [that the aforementioned degradation detection means detects degradation of the aforementioned ozone purification catalyst based on the output of the above 1st and the 2nd ozone level detection means, and the output of the aforementioned air-capacity detection means, and] as the feature.
[Claim 3] The ozone purge for vehicles according to claim 1 or 2 characterized by having an ozone supply means to supply ozone to the upstream of the ozone level detection means of the above 1st of the airstream which passes the aforementioned ozone purification catalyst.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to what especially vehicles equip with and is used about the ozone purge which purifies the ozone in the atmosphere (O3).
[0002]
[Description of the Prior Art] When vehicles run, paying attention to air contacting and flowing on the body front face, radiator front face, etc., an ozone purification catalyst is arranged into such a portion, and the equipment which purifies the ozone in the atmosphere is proposed conventionally (****** No. 507289 [11 to] official report). This equipment tends to suppress generating of photochemical smog by purifying the ozone in the atmosphere.
[0003]
[Problem(s) to be Solved by the Invention] In such an ozone purge, when foreign matters, such as dust, adhere to the front face, the amount of ozone which the dust especially whose particle size is several microns invades into a catalyst bed, and checks diffusion of the ozone in a catalyst bed, or contacts a catalyst by blinding etc. is decreased. Therefore, the amount of ozone purified by the catalyst will decrease and the decontamination-capacity force of an ozone purge will decline. Or there was a trouble that the decontamination-capacity force of an ozone purge itself may decline, by the sulfur oxide (SOx) in the atmosphere etc.
[0004] this invention is made paying attention to this point, and it aims at offering the ozone purge for vehicles equipped with the function which can carry out things to detect certainly degradation of the ozone purification catalyst caused by various causes, such as degradation by foreign matters, such as dust, adhering and

degradation resulting from SOx.

[0005]

[Means for Solving the Problem] In order to attain the above-mentioned purpose invention according to claim 1 The 1st ozone level detection means which detects the ozone level in air before passing the ozone purification catalyst carried in vehicles, and the aforementioned ozone purification catalyst, The 2nd ozone level detection means which detects the ozone level in air after passing the aforementioned ozone purification catalyst, The ozone purge for vehicles characterized by having a degradation detection means to detect degradation of the aforementioned ozone purification catalyst, using the output of the above 1st and the 2nd ozone level detection means is offered.

[0006] Since according to this composition the ozone level in the ozone level in air before passing an ozone purification catalyst, and air after passing an ozone purification catalyst is detected and degradation of an ozone purification catalyst is detected using the this detected ozone level The decontamination-capacity force of an ozone purification catalyst can be grasped directly, degradation of the ozone purge caused by various causes, such as degradation by foreign matters, such as dust, adhering and degradation resulting from SOx, is detected certainly, and the thing of it can be carried out.

[0007] Invention according to claim 2 is further equipped with an air-capacity detection means to detect the air capacity which passes the aforementioned ozone purification catalyst in the ozone purge for vehicles according to claim 1, and the aforementioned degradation detection means carries out detecting degradation of the aforementioned ozone purification catalyst based on the output of the above 1st and the 2nd ozone level detection means, and the output of the aforementioned air-capacity detection means as the feature.

[0008] According to this composition, the air capacity which passes an ozone purification catalyst is detected, and degradation of an ozone purification catalyst is detected with the output of the 1st and 2nd ozone level detection meanses based on detection air capacity. Since the performance of an ozone purge is proportional to the product of the decontamination-capacity force of an ozone purification catalyst, and the air capacity which passes an ozone purification catalyst, by detecting air capacity, it also considers the influence of the blinding resulting from adhesion of dust etc., can evaluate the performance of the ozone purge concerned synthetically, and can detect degradation, and the high degradation detection of precision of it is attained more.

[0009] Invention according to claim 3 is characterized by having an ozone supply

means to supply ozone to the upstream of the ozone level detection means of the above 1st of the airstream which passes the aforementioned ozone purification catalyst in the ozone purge for vehicles according to claim 1 or 2. Since ozone is supplied to the upstream of the 1st ozone level detection means of the airstream which passes an ozone purification catalyst according to this composition, even when the detectable range of an ozone level detection means is narrow, it becomes possible to detect the decontamination-capacity force of an ozone purification catalyst correctly.

[0010] It is desirable to form the diffusion prevention pipe which prevents diffusion of the ozone supplied from an ozone supply means, and it is still better to establish an ozonolysis means to decompose ozone into the downstream of the 2nd ozone level detection means. Moreover, the diffusion prevention pipe of the upstream of an ozone purification catalyst and the diffusion prevention pipe of a downstream are connected, and it is good also as a circulated type diffusion prevention pipe. It is good for a circulated type diffusion prevention pipe to operate a ventilation means so that it may become the air rate of flow which established a ventilation means to generate an airstream and was suitable for the concentration detection by the ozone level detection means.

[0011] As for the component for degradation detection, such as an ozone level detection means, an ozone supply means, and a diffusion prevention pipe, it is still more desirable except the degradation detection execution time to have the move means moved to the position which flows into an ozone purification catalyst and does not bar the airstream flowing out.

[0012]

[Embodiments of the Invention] The form of operation of this invention is explained with reference to a drawing below. Drawing 1 is drawing showing the composition of the ozone purge for vehicles concerning 1 operation form of this invention. This equipment is equipped with the ozone level sensors 2 and 3 which detect the ozone level in air, the vehicle speed sensor which detects the rolling-stock-run speed (vehicle speed) VP concerned, and the electronic control unit (henceforth "ECU") 4 which detects degradation of an ozone purification catalyst based on the output of these sensors, and is constituted while making the front face of the radiator 1 of vehicles support an ozone purification catalyst. As an ozone purification catalyst, as shown, for example in JP,5-317717,A, what makes a principal component manganese carbonate ($MnCO_3$) and manganese oxide (MnO_x) is used. Moreover, what used divalent metals, such as magnesium (Mg) and calcium (calcium), and the compound

with an indium (In) and oxygen (O) as the gas induction object as ozone level sensors 2 and 3 as shown, for example in JP,6-82409,A is used.

[0013] A radiator 1 is the heat dissipation means established in order to reduce the temperature of the engine cooling water which cools the engine (not shown) of the vehicles concerned. The airstream generated by the rolling stock run flows, as Arrow A shows to drawing. The ozone level sensor 2 is arranged at the upstream of a radiator 1 of this airstream, and the ozone level sensor 3 is arranged at the downstream. The ozone level in air before passing an ozone purification catalyst is detected by the upstream ozone level sensor 2, and the ozone level in air after passing an ozone purification catalyst by the downstream ozone level sensor is detected.

[0014] Degradation of an ozone purification catalyst is detected by comparing upstream ozone level CTO3U detected by the upstream ozone level sensor 2, and downstream ozone level CTO3L detected by the downstream ozone level sensor 3. More specifically, it is defined as rate RPof purification =1-CTO3 L/CTO3U, and when [in an initial state (new state)] it receives rate RPof purification 0, for example, becomes 50% or less, it judges with the ozone purification catalyst having deteriorated (when it becomes RP<=RP 0x0.5). And an operator is told about the result by making a lamp turn on etc. Or it is defined as degradation degree RD=RP/RP0, and you may make it display this degradation degree itself.

[0015] The ozone level in air before passing the radiator 1 which supports an ozone purification catalyst according to this operation form, Since the ozone level in air after passing a radiator 1 is detected and degradation of an ozone purification catalyst is detected using the this detected ozone level The decontamination-capacity force of an ozone purification catalyst can be grasped directly, degradation of the ozone purge caused by various causes, such as degradation by foreign matters, such as dust, adhering and degradation resulting from SOx, is detected certainly, and the thing of it can be carried out.

[0016] In addition, the rate RP of ozone purification changes with a wind speed, i.e., the air rate of flow, as a solid line shows to drawing 3 . Since the rate RP of purification specifically falls so that a wind speed becomes high, you may make it set up the threshold for a degradation judging so that it may become so small that a wind speed becomes high at drawing 3 as a dashed line shows. In this case, it is desirable to set up the threshold for a degradation judging according to the wind speed which presumed and this presumed the wind speed according to the detected vehicle speed VP. ECU4 constitutes a degradation detection means and the vehicle speed sensor 5

constitutes an air-capacity detection means from an example shown in drawing 1 .

[0017] (Modification 1) it is further shown in drawing 2 -- as -- the wind-speed sensor 6 -- a radiator 1 -- it prepares in a downstream immediately and you may make it the wind-speed sensor 6 detect a wind speed Since the influence of a fall of the wind speed resulting from the blinding of an ozone purification catalyst etc. can be made to reflect by this, it becomes possible to detect a more exact degradation degree.

[0018] In addition, it replaces with a wind-speed sensor and a pressure sensor is prepared in the upstream and downstream of a radiator 1, and passage air capacity is detected from the difference of the detection pressure of two pressure sensors, and you may make it presume a wind speed from detection air capacity. That is, two pressure sensors prepared in the upstream and downstream of the wind-speed sensor 6 or a radiator 1 may constitute an air-capacity detection means.

[0019] (Modification 2) Concentration is changing with reactions with NO by which an actual ozone level on the street is discharged from vehicles a lot. Moreover, the ozone level in the atmosphere falls in the winter when atmospheric temperature and intensity of radiation fall. In such a case, depending on the ozone level sensor to be used, a speed of response may be too slow, or it may separate from a detectable density range, and the degradation degree of an ozone purification catalyst may be unable to be detected correctly.

[0020] Then, in order to cope with it in such a case, as shown in drawing 4 , it is good to form the ozonator 7 as an ozone supply means to supply ozone to the upstream of the upstream ozone level sensor 2.

[0021] Drawing 6 is the circuit diagram showing the example of composition of an ozonator 7, and an ozonator 7 is constituted by the switch 21 with which the DC-power-supply voltage VD is supplied, the pressure-up coil 22, diode 23, and the corona electrode 24. To a switch 21, a control signal SCTL is supplied from ECU4, and turning on and off of a switch 21 is controlled by ECU4. When generating ozone, a switch 21 is changed from OFF to ON. By this, the high voltage occurs in the secondary of the pressure-up coil 22, electric discharge occurs in the corona electrode 22, and ozone is generated.

[0022] As the precision of the ozone level sensor to be used turns into concentration secured enough using an ozonator 7, by generating ozone, highly precise ozone level detection is performed and it becomes possible to detect a degradation degree correctly.

[0023] (Modification 3) Drawing 5 shows the modification of the composition of

drawing 4 . This example forms ozonolysis equipment 8 near the outlet of the diffusion prevention pipe 11 while it forms the diffusion prevention pipes 10 and 11 in the upstream and downstream of a radiator and passes the inside of the diffusion prevention pipe 10 and 11 for the generated ozone. Thus, by constituting, it can prevent emitting the generated ozone outside a vehicle. In addition, it replaces with ozonolysis equipment 8 and you may make it prepare an ozone recovery system.

[0024] Moreover, if the diffusion prevention pipes 10 and 11, an ozonator 7, and ozonolysis equipment 8 are always installed near the posterior near the anterior of a radiator 1, the influence of various degradation factors may decrease as compared with other places, and the precision of a decontamination-capacity force judging as the whole ozone purification catalyst may fall. Then, when the diffusion prevention pipes 10 and 11 with which an ozonator 7, ozonolysis equipment 8, and the ozone level sensors 2 and 3 were fixed are fixed to the arm 12 which can be rotated centering on a shaft 13 as shown in drawing 7 , and not performing the degradation judging of an ozone purification catalyst, it is desirable to make it contain to a housing 14.

[0025] (Modification 4) Drawing 8 forms the circulated type diffusion prevention pipe 15 which has arranged the blower 16 with an ozonator 7 and the ozone level sensors 2 and 3, and shows the ozone purge it was made to make drawing circulate through air as an arrow shows.

[0026] With this equipment, since the air containing the ozone generated with the ozonator 7 circulates, after it generates ozone first and detects concentration, the ozone purification catalyst which made the generated ozone adhere to a radiator 1 can purify by making it not newly generate ozone.

[0027] Moreover, since a blower 16 can adjust the speed (wind speed) of an airstream, it can be set as the optimal speed for detection of an ozone level, and can detect a degradation degree. In addition, as shown in drawing 9 , when forming the power unit 17 which rotates the diffusion prevention pipe 15 and not performing detection of a degradation degree in this case, either, it is desirable to rotate the diffusion prevention pipe 15 and to make it not lap with the front face of a radiator 1 and a rear face.

[0028]

[Effect of the Invention] The ozone level in air as explained in full detail above, before passing an ozone purification catalyst according to invention according to claim 1, And since the ozone level in air after passing an ozone purification catalyst is detected and degradation of an ozone purification catalyst is detected using the this detected ozone level The decontamination-capacity force of an ozone purification catalyst can

be grasped directly, degradation of the ozone purge caused by various causes, such as degradation by foreign matters, such as dust, adhering and degradation resulting from SOx, is detected certainly, and the thing of it can be carried out.

[0029] According to invention according to claim 2, the air capacity which passes an ozone purification catalyst is detected, and degradation of an ozone purification catalyst is detected with the output of the 1st and 2nd ozone level detection meanses based on detection air capacity. Since the performance of an ozone purge is proportional to the product of the decontamination-capacity force of an ozone purification catalyst, and the air capacity which passes an ozone purification catalyst, by detecting air capacity, it also considers the influence of the blinding resulting from adhesion of dust etc., can evaluate the performance of the ozone purge concerned synthetically, and can detect degradation, and the high degradation detection of precision of it is attained more.

[0030] Since ozone is supplied to the upstream of the 1st ozone level detection means of the airstream which passes an ozone purification catalyst according to invention according to claim 3, even when the detectable range of an ozone level detection means is narrow, it becomes possible to detect the decontamination-capacity force of an ozone purification catalyst correctly.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the composition of the ozone purge concerning 1 operation gestalt of this invention.

[Drawing 2] It is drawing showing the modification (modification 1) of the composition of drawing 1 .

[Drawing 3] It is drawing showing the speed (wind speed) of the airstream which passes an ozone purification catalyst, and a relation with the rate of purification.

[Drawing 4] It is drawing showing the modification (modification 2) of the composition of drawing 1 .

[Drawing 5] It is drawing showing the modification (modification 3) of the composition of drawing 4 .

[Drawing 6] It is the circuit diagram of the example of composition of an ozonator.

[Drawing 7] It is drawing showing the desirable embodiment of composition of being shown in drawing 5 .

[Drawing 8] It is drawing showing the modification (modification 4) of the composition of drawing 5 .

[Drawing 9] It is drawing showing the desirable embodiment of the composition of drawing 8 .

[Description of Notations]

1 Radiator

2 Ozone Level Sensor (1st Ozone Level Detection Means)

3 Ozone Level Sensor (2nd Ozone Level Detection Means)

4 Electronic Control Unit (Degradation Detection Means)

5 Vehicle Speed Sensor (Air-Capacity Detection Means)

6 Wind-Speed Sensor (Air-Capacity Detection Means)

7 Ozonator (Ozone Supply Means)

[Translation done.]